Amendments to the Claims:

Please amend Claims 1, 4, 6, and 11, and add new Claims 54 – 62 as indicated in the following listing of claims, which replaces all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A microfluidic device comprising:

a microfluidic flow channel formed in a first layer;

a first microfluidic control channel formed in a second layer adjacent to the first layer, the first microfluidic control channel separated from the microfluidic flow channel by a first deflectable membrane <u>integral with the first layer or the second layer</u>; and

a second microfluidic control channel adjacent to the first microfluidic control channel and separated from the first microfluidic control channel by a second deflectable membrane.

2. (Previously Presented) The microfluidic device of claim 1 wherein the first layer underlies the second layer.

3. (Previously Presented) The microfluidic device of claim 1 wherein the first layer overlies the second layer.

4. (Currently Amended) ~~**The**~~ <u>A</u> microfluidic device ~~**of claim 1**~~ <u>comprising:</u>

<u>a microfluidic flow channel formed in a first layer;</u>

<u>a first microfluidic control channel formed in a second layer adjacent to the first layer, the first microfluidic control channel separated from the microfluidic flow channel by a first deflectable membrane; and</u>

a second microfluidic control channel adjacent to the first microfluidic control channel and separated from the first microfluidic control channel by a second deflectable membrane, wherein the second microfluidic control channel is formed in the first layer and does not intersect with the microfluidic flow channel.

5. (Previously Presented) The microfluidic device of claim 1 wherein the second microfluidic control channel is formed in a third layer adjacent to the second layer.

6. (Currently Amended) The microfluidic device of claim 1 wherein:

the ~~first~~ microfluidic flow channel comprises a network of flow channels;

the first microfluidic control channel comprises a branched network of channels sharing a common inlet and having widened portions; and

the second microfluidic control channel comprises a network of channels having separate inlets and also having widened portions.

7. (Previously Presented) The microfluidic device of claim 6 wherein:

a number of branches of the first control channel network equals a number of the flow channels, each first control channel branch including only one widened portion at a corresponding flow channel branch; and

the channels of the second control channel network are arranged in a multiplexor configuration, thereby defining an inverse multiplexor structure.

8. (Previously Presented) The microfluidic device of claim 6 wherein:

a number of branches of the first control channel network is fewer than a number of the flow channels and have widened portions arranged in a first multiplexor configuration; and

a number of channels of the second control channel network is fewer than a number of the flow channels and have widened portions arranged in a second multiplexor configuration, thereby defining a cascaded multiplexor structure.

9. (Previously Presented) The microfluidic device of claim 6 wherein at least one of the first control channel network and the second control channel network comprise a first stage having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 2.

10. (Previously Presented) The microfluidic device of claim 9 wherein the at least one of the first control channel network and the second control channel network further comprises a second stage having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 1.

11. (Currently Amended) ~~The~~ A microfluidic device ~~of claim 1 further~~ comprising:

a microfluidic flow channel formed in a first layer;

a first microfluidic control channel formed in a second layer adjacent to the first layer, the first microfluidic control channel separated from the microfluidic flow channel by a first deflectable membrane;

a second microfluidic control channel adjacent to the first microfluidic control channel and separated from the first microfluidic control channel by a second deflectable membrane; and

a third microfluidic control channel adjacent to the second microfluidic control channel and separated from the second microfluidic control channel by a third deflectable membrane.

12. (Previously Presented) The microfluidic device of claim 11 wherein:

the first microfluidic flow channel comprises a network of flow channels;

the first microfluidic control channel comprises a first branched network of channels sharing a first common inlet and having widened portions;

the second microfluidic control channel comprises a second branched network of channels sharing a second common inlet and also having widened portions; and

the third microfluidic control channel comprises a network of channels having separate inlets and also having widened portions.

13. – 53. (Canceled).

54. (New) The microfluidic device of claim 4 wherein:

the microfluidic flow channel comprises a network of flow channels;

the first microfluidic control channel comprises a branched network of channels sharing a common inlet and having widened portions; and

the second microfluidic control channel comprises a network of channels having separate inlets and also having widened portions.

55. (New) The microfluidic device of claim 54 wherein:

a number of branches of the first control channel network equals a number of the flow channels, each first control channel branch including only one widened portion at a corresponding flow channel branch; and

the channels of the second control channel network are arranged in a multiplexor configuration, thereby defining an inverse multiplexor structure.

56. (New) The microfluidic device of claim 54 wherein:

a number of branches of the first control channel network is fewer than a number of the flow channels and have widened portions arranged in a first multiplexor configuration; and

a number of channels of the second control channel network is fewer than a number of the flow channels and have widened portions arranged in a second multiplexor configuration, thereby defining a cascaded multiplexor structure.

57. (New) The microfluidic device of claim 54 wherein at least one of the first control channel network and the second control channel network comprise a first stage

having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 2.

58. (New) The microfluidic device of claim 57 wherein the at least one of the first control channel network and the second control channel network further comprises a second stage having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 1.

59. (New) The microfluidic device of claim 12 wherein:

a number of branches of the first control channel network equals a number of the flow channels, each first control channel branch including only one widened portion at a corresponding flow channel branch; and

the channels of the second control channel network are arranged in a multiplexor configuration, thereby defining an inverse multiplexor structure.

60. (New) The microfluidic device of claim 12 wherein:

a number of branches of the first control channel network is fewer than a number of the flow channels and have widened portions arranged in a first multiplexor configuration; and

a number of channels of the second control channel network is fewer than a number of the flow channels and have widened portions arranged in a second multiplexor configuration, thereby defining a cascaded multiplexor structure.

61. (New) The microfluidic device of claim 12 wherein at least one of the first control channel network, the second control channel network, and the third control channel network comprise a first stage having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 2.

62. (New) The microfluidic device of claim 61 wherein the at least one of the first control channel network, the second control channel network, and the third control channel

network further comprises a second stage having at least xlogxn control channels, where n is the number of flow channels and x is an integer greater than 1.